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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,248	07/30/2003	Xueying Huang	CL1943USNA	9378
23906 7590 12/05/2007 E I DU PONT DE NEMOURS AND COMPANY LEGAL PATENT RECORDS CENTER BARLEY MILL PLAZA 25/1128 4417 LANCASTER PIKE WILMINGTON, DE 19805			EXAMINER LIN, JAMES	
			ART UNIT 1792	PAPER NUMBER
			NOTIFICATION DATE 12/05/2007	DELIVERY MODE ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PTO-Legal.PRC@usa.dupont.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/630,248	<b>Applicant(s)</b> HUANG ET AL.	
	<b>Examiner</b> Jimmy Lin	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 September 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) 1,3,4,18 and 20-32 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2,5-17,19,33 and 34 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 2, 5-17, 19, and 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Templeton et al. (*Langmuir* 1999, 15, pg. 66-76) in view of Foos et al. (*Chem. Mater.* 2002, 14, pg. 2401-2408).

Templeton discloses a method for preparing a water-soluble gold nanoparticle coated with a mixed monolayer (abstract) comprising:

Mixing tetrachloroauric acid (i.e., a metal salt), tiopronin (i.e., a capture coating component), and a mixed solvent comprising sodium borohydride (i.e., a reducing agent and a water miscible solvent), and water (i.e. an aqueous solvent) (pg. 67, column 2, 3<sup>rd</sup> full paragraph). The pH of the mixed solvent would have a pH less than 7.0 because the sodium borohydride becomes a proton donor in water and is therefore an acid.

The water-soluble gold nanoparticle can be isolated (abstract).

Templeton teaches the above method in order to achieve a nanoparticle with increased water solubility, but does not explicitly teach using a shielding component in the method of preparing a water-soluble gold nanoparticle. However, Foos teaches that an ethylene glycol oligomer (i.e., a shielding component) can be used in the preparation of a gold nanoparticle (abstract) to increase water solubility (pg. 2401 column 1 – pg. 2402 column 1).

“It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose.... [T]he idea of combining them flows logically from their having been individually taught in the prior art.” In re Kerkhoven, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to have used an ethylene glycol oligomer in the preparation of water-soluble gold nanoparticles

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of Templeton because Foos teaches that an ethylene glycol oligomer can increase the water solubility of a gold nanoparticle.

Claim 5: Templeton teaches that the metal of the metallic nanoparticle is gold.

Claim 6: Templeton teaches that the metal salt is tetrachloroauric acid (i.e.,  $\text{HAuCl}_4$ ).

Claims 7,8: Templeton teaches that the capture coating component is tiopronin. Because the current specification exemplifies tiopronin as a preferred capture coating component, tiopronin can inherently capture at least one of the capture moieties listed.

Claim 9: Templeton teaches that the metal binding functionality binds to gold.

Claim 10: The tiopronin of Templeton has an SH functionality group that binds to gold. The tetraethylene glycol thiol of Foos (abstract) also has an SH functionality group that binds to gold.

Claim 11: Templeton teaches that methanol is a suitable solvent in the preparation of the gold nanoparticles (pg. 67, column 2, 3<sup>rd</sup> full paragraph).

Claim 12: Templeton teaches that the aqueous solvent is water.

Claim 13: Templeton teaches that the reducing agent is sodium borohydride (i.e.,  $\text{NaBH}_4$ ).

Claims 14-17: Foos teaches that the shielding component is tetraethylene glycol thiol.

Claim 19: Templeton and Foos do not explicitly teach that the shielding component comprises at least 50% of the mixed monolayer. However, one skilled in the art would have expected to modify the monolayer to have equal amounts of the capture component of Templeton and the shielding component of Foos with a reasonable expectation of success. A 50/50 ratio would still allow the gold nanoparticle to receive the benefit of increased water solubility because both the capture component of Templeton and the shielding component of Foos are taught to increase the water solubility of the gold nanoparticle. Therefore, it would have been an obvious modification to have the shielding component comprising 50% of the monolayer.

Claims 33-34: Templeton and Foos do not explicitly teach a final water concentration in the reaction mixture, particularly from about 9% to about 18% V/V. However, a particular parameter can be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, and thus the determination of the optimum or workable ranges of said variable

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might be characterized as routine experimentation. In re Antonie, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). Templeton teaches that while the metal salt and capture coating component are soluble in methanol, the crude nanoparticle coated with a monolayer is insoluble in methanol but quite soluble in water (pg. 67, column 2, 3<sup>rd</sup> and 5<sup>th</sup> full paragraphs). The starting materials dissolve in the organic solvent, and as the product forms, the nanoparticles coated with a monolayer precipitate into the water. The nanoparticles coated with a monolayer can then be easily separated from the starting materials. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to find the optimum water concentration of the mixed solvent by routine experimentation. One would have been motivated to do so in order to optimize the results of the process.

### ***Response to Arguments***

3. Applicant's arguments filed 9/27/2007 have been fully considered but they are not persuasive.

Dr. Zheng argues on pg. 3-4 of the Declaration filed 9/27/2007 that although Exhibits 1 and 2 do not explicitly demonstrate that the final concentration of water in the reaction mixture for the direct synthesis of Au particles with ethylene glycol coating is from about 9% to about 18% V/V, it is clear from the "Conclusions" of Exhibit 7H that Dr. Huang and Dr. Zheng were cognizant of the importance of the concentration of water to the stability of gold nanoparticles. Dr. Zheng further argues that the absence of CH<sub>3</sub>COOH is the first conclusion (i.e., higher concentration of water) and presence of CH<sub>3</sub>COOH in the second conclusion (i.e., lower concentration of water) and Dr. Huang's comments about stability indicate his cognizance of the importance of the concentration of water to the stability and yield of the gold nanoparticles with ethylene glycol coating. However, the "Conclusions" of Exhibit 7H only shows the recognition that CH<sub>3</sub>COOH helps to control formation of the gold particles with ethylene glycol coating. Although the presence or absence of water indirectly affects the concentration of water, there is no acknowledgement whatsoever that the actual water concentration itself had any effect on the reaction because the "Conclusions" only compare the reaction "(1) Without CH<sub>3</sub>COOH" and "(2) With CH<sub>3</sub>COOH". Nevertheless, the limitation "wherein the final concentration of water in the reaction mixture is from about 9% to about 18% V/V" has been removed from claim 2, thereby

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moving the claimed invention even further away from the method of Exhibits 1-2 and 3H-8H because the method of said Exhibits uses at least some water.

Dr. Zheng argues on pg. 4-5 of the Declaration filed 9/27/2007 that the Declaration demonstrates “reduction to practice for the claimed coated metallic nanoparticles because (i) the binding specificity and (ii) the resistance to non-specific binding are rendered by the choice of ligand and the function of ethylene glycol oligomers. Dr. Zheng further argues that the chemical identity of the core metal does not play a role here because the metal core is buried or shielded by the coating and does not interact directly with the environment.” First, with the exception of claim 15, the claims are not limited to ethylene glycol oligomers and there is no evidence that any shielding component as claimed would be operable in the invention as claimed. Second, it is not the function of the core metal in the final product that is important, but rather it is whether the claimed method would work with any metal other than gold (i.e., the metal used in Exhibits 1-2 and 3H-8H) that is important. For example, there is no evidence that mercury or osmium metals would work with the claimed invention. Applicants fail to explain why the particular materials presented in the Exhibits 1-2 and 3H-8H would indicate that the broad genus in which those materials belong to would be operable in the claimed method. There is no indication that all metal salts, all shielding components, all capture coating components, all reducing agents, all water miscible solvents, and all aqueous solvents, other than the components used Exhibits 1-2 and 3H-8H, would be operable in the claimed method. Additionally, only a pH range of 2.0 to 5.0 is shown to be operable in the "Conclusion" section of Exhibit 7H while the claim requires a broader pH range of less than 7.0. There is no indication that a pH outside of the range of 2.0 to 5.0 (e.g., a pH of 1 or 6) would be operable in the claimed invention.

On pg. 13 of the Response, Applicant disagrees with Examiner's position that the provisional patent application of the present invention does not fully support independent claim 2 because the provisional does not teach the use of any shielding component but rather only supports the use of ethylene glycol. Applicant argues that ethylene glycol is a shielding coating component and “shielding coating component” is defined in the provisional patent application on pg. 5, lines 1-5, which also state that ethylene glycol is a preferred shielding coating component. However, the shielding component as required in claim 2 is not limited to only ethylene glycol. For at least this reason, the provisional does not fully support the claims (with the exception of

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claim 15) and the rejection is based upon a statutory bar. A Declaration under 37 CFR 1.131 cannot overcome a statutory bar.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jimmy Lin whose telephone number is 571-272-8902. The examiner can normally be reached on Monday thru Friday 8AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JL  
JL

  
**TIMOTHY MEEKS**  
**SUPERVISORY PATENT EXAMINER**